

REMARKS

Please reconsider the present application in view of the above amendments and the following remarks. Applicant thanks the Examiner for the courtesies extended in the Examiner Interview of April 12, 2004 and for carefully considering the present application.

I. Disposition of Claims

Claims 1-28 are currently pending in the present application. By way of this reply, claims 1, 8, 15, and 22 have been amended.

II. Claim Amendments

Claims 1 and 8 have been amended to clarify that the various referred-to vias are connected to the respective referred-to regions of the metal layer. Further, claims 1 and 8 have been amended to clarify that an area of the metal layer linearly extending across the metal layer is laterally disposed between the landing pad portion and both the first plurality of vias and the second plurality of vias. No new matter has been added by way of these amendments as support for these amendments may be found, for example, in Figure 5a of the present application.

Claim 15 has been amended to clarify that the various referred-to vias are connected to the respective referred-to regions of the metal layer. Further, claim 15 has been amended to clarify that an area of the metal layer linearly extending across the metal layer is laterally disposed between the landing pad portion and both the first density of vias and the second density of vias. No new matter has been added by way of these

amendments as support for these amendments may be found, for example, in Figure 5a of the present application.

Claim 22 has been amended to remove the limitation of the vias in at least one of the first region and the second region being laterally peripheral to the landing pad portion. No new matter has been added by way of this amendment.

III. Rejection(s) Under 35 U.S.C § 102

U.S. Patent No. 5,736,791

Claims 1-22 of the present application were rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 5,736,791 issued to Fujiki et al. (hereinafter "Fujiki"). For the reasons set forth below, this rejection is respectfully traversed.

The present invention is directed to an integrated circuit structure in which vias are selectively positioned around a bump so as to increase the uniformity of current distribution around the bump, thereby reducing current crowding at the bump. *See* Specification, paragraph [0024]. With reference to the exemplary embodiment of the present invention shown in Figure 5b of the present application, an integrated circuit structure in accordance with the present invention includes at least (i) a bump **44** disposed on a landing pad portion **52** of a metal layer **M8**, (ii) a first density/plurality of vias **50a** connected to a first outer region **57a** of the metal layer **M8**, (iii) a second density/plurality of vias **50b** connected to a second outer region **57b** of a metal layer **M8**, and (iv) a third density of vias connected to a central region **57c** disposed between the first outer region **57a** and the second outer region **57b**. Because vias **50a**, **50b** are more heavily concentrated along outer regions **57a**, **57b** of the metal layer **M8** than in the central

region **57c**, such an arrangement of vias leads to increased current distribution uniformity and reduced current crowding at the bump **44**. *See* Specification, paragraph [0028].

Further, in order to clarify the arrangement of the claimed invention, independent claims 1, 8, and 15 of the present application have been amended to recite that an area of the metal layer *linearly* extending across the metal layer is laterally disposed between the landing pad portion and both the first density/plurality of vias and the second density/plurality of vias. For example, as shown in Figure 5a of the present application, the area of the metal layer **M8** left of the landing pad portion **52** and right of the first and second densities/pluralities of vias **50a**, **50b** is an area that (i) *linearly* extends across the metal layer **M8** (e.g., running between the top and bottom of the metal layer **M8** as represented in Figure 5a) *and* (ii) is laterally disposed between the landing pad portion **52** and both the first and second densities/pluralities of vias **50a**, **50b**.

Fujiki fails to disclose at least the limitations of amended independent claims 1, 8, and 15 of the present application discussed above. For example, with reference to Figure 7 of Fujiki and as agreed to by the Examiner in the Examiner Interview of April 12, 2004, there is no area of the purported metal layer **6** that (i) *linearly* extends across the purported metal layer **6** *and* (ii) is laterally disposed between the landing pad portion **D** (or “bonding region” as recited in Fujiki, column 10, line 67 – column 11, line 1) and both the purported first density of vias (**5**, at the top right corner) and the purported second density of vias (**5**, at the bottom-right corner). Instead, in Figure 7 of Fujiki, the vias **5** are disposed with respect to the landing pad portion **D** in a manner that actually results in current crowding at the 45, 135, 225, and 315 degree points of the landing pad portion **D** (the top-most point of the bump **D** representing the 0 degree point and

ascending in a clock-wise direction).

Due to the lack of an area laterally disposed between the landing pad portion **D** and both the first and second density of vias **5**, the differences in current path lengths from the vias **5** to the bump (within the area of the landing pad portion **D**) are relatively, on a percentage basis, much greater than the differences in current path lengths shown in, for example, Figure 5a of the present application. As discussed in paragraph [0028] of the Specification, increased uniformity in current path lengths between vias and the bump leads to increased uniformity in current distribution. Accordingly, because Fujiki fails to disclose, or otherwise teach, an area of the purported metal layer **6** that linearly extends across the purported metal layer **6** and is laterally disposed between the landing pad portion **D** and both the first and second density of vias **5**, Fujiki fails to disclose each and every limitation of amended independent claims 1, 8, and 15 of the present application.

With respect to amended independent claim 22 of the present application, a method for reducing current crowding on a bump in accordance with the present invention comprises at least (i) determining a first current path length from a first region of a metal layer to a bump, (ii) determining a second current path length from a second region of the metal layer to the bump, and (iii) disposing particular densities vias in the first and second regions dependent on the first and second current path lengths, respectively. Although on pages 5 – 6 of the final Office Action of March 19, 2004, the Examiner states that Fujiki discloses these limitations of amended independent claim 22 of the present application, the Examiner fails to cite any portion of Fujiki that discloses any of actually *determining* a first current path length, *determining* a second current path length, or disposing vias in regions of a metal layer *dependent* on the determined first and

second current path lengths.

Applicant has reviewed Fujiki in its entirety and has found no disclosure or teaching that indicates the determination of current path lengths between regions of a metal layer and the bump and the subsequent disposition of vias in the regions dependent on any determined current path lengths. In fact, Fujiki is altogether silent as to current path lengths between regions of a metal layer and a bump. Accordingly, Fujiki fails to disclose all the limitations of amended independent claim 22 of the present application.

In view of the above, Fujiki fails to show or suggest the present invention as recited in amended independent claims 1, 8, 15, and 22 of the present application. Thus, amended independent claims 1, 8, 15, and 22 of the present application are patentable over Fujiki. Dependent claims are allowable for at least the same reasons. Accordingly, withdrawal of this rejection is respectfully requested.

U.S. Patent No. 6,365,970

Claims 22-28 of the present application were rejected under 35 U.S.C. § 102(e) as being anticipated by U.S. Patent No. 6,365,970 issued to Tsai et al. (hereinafter "Tsai"). For the reasons set forth below, this rejection is respectfully traversed.

Although on pages 6 – 7 of the final Office Action of March 19, 2004, the Examiner states that Tsai discloses these limitations of amended independent claim 22 of the present application, the Examiner fails to cite any portion of Tsai that discloses any of actually *determining* a first current path length, *determining* a second current path length, or disposing vias in regions of a metal layer *dependent* on the determined first and second current path lengths. Applicant has reviewed Tsai in its entirety and has found no

disclosure or teaching that indicates the determination of current path lengths between regions of a metal layer and the bump and the subsequent disposition of vias in the regions dependent on any determined current path lengths. In fact, Tsai is altogether silent as to current path lengths between regions of a metal layer and a bump. Accordingly, Tsai fails to disclose (i) determining a first current path length from a first region of a metal layer to a bump, (ii) determining a second current path length from a second region of the metal layer to the bump, and (iii) disposing particular densities vias in the first and second regions dependent on the respective first and second current path lengths as required by amended independent claim 22 of the present application.

In view of the above, Tsai fails to show or suggest the present invention as recited amended independent claim 22 of the present application. Thus, amended independent claim 22 of the present application is patentable over Tsai. Dependent claims are allowable for at least the same reasons. Accordingly, withdrawal of this rejection is respectfully requested.

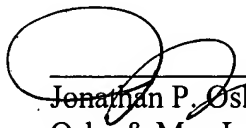
IV. Conclusion

The above amendments and remarks are believed to require no further prior art search. Also, Applicant believes that this reply is responsive to all outstanding issues and places this application in condition for allowance. If this belief is incorrect, or other issues arise, the Examiner is encouraged to contact the undersigned or his associates at the telephone number listed below. Because the amendments and remarks simplify the issues for allowance or appeal, and do not constitute new matter, entry and consideration thereof is respectfully requested.

Please apply any charges not covered, or any credits, to Deposit Account 50-0591 (Reference Number 03226.156001;P6864).

Respectfully submitted,

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